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**How to make the perfect compost lavatory**

THERE are few international conferences these days at which delegates can hope to be presented with a souvenir ball of dried human faeces. Indeed the World Toilet Summit, which was convened in Delhi last week, may be the only one.

The excrement was a gift from one of the organisers, the Sulabh International Social Service Organisation (SISSO). An Indian NGO, it has built over a million toilets in a country where over 700m people still have no access to one.

The faecal ball, about the size of a plum, had been fashioned from the contents of one of them. It was apparently evidence of the organisation's efficient way of composting excrement to render it bacteria-free. One of the NGO's staffers—in all seriousness—recommended its use as a paper-weight.

EPA

**Assessing the solutions**

The purpose of the summit, which was attended by distinguished guests, including the Netherlands' Prince of Orange, was serious indeed. At issue was the UN's Millennium Development Goal of providing lavatory access for everyone in the world by 2025.

It will be tough. About 2.6 billion people—about one-third of the world's population—currently lack this convenience. According to Bindeshwar Pathak, SISSO's founder, the result is some 200m tonnes of human excrement a year left lying in the open—an obvious health hazard.

Two difficulties involve money and water. There is probably not enough of either to make up the shortfall with conventional flush toilets. Currently, for example, less than 250 of India's 5,000 biggest towns have the sewage system that these generally depend upon. And the cheapest septic tank, the alternative, costs several hundred dollars, a prohibitive sum for most Indian families. "Everybody agrees: sewage systems and septic tanks are out," said Dr Pathak.

So the summit was an opportunity to showcase cheaper and more efficient toilet technologies. Most were variations on the theme of using heat, typically generated with solar panels, to accelerate the natural decomposition of human waste.

Offerings came from South Africa, the Netherlands and India, promising various green, odourless and cost-cutting toilet solutions. But there appeared to be no better suggestions than SISSO's own.

The organisation's toilets, which include 6,500 public facilities, are based on two simple innovations. By setting the bowl—of a shallow Asian variety—at a downward slope of 22 degrees, the toilet can be washed clean with two litres of water (a flush toilet uses 10 litres). The toilet empties into one of two cess-pits, which are rotated every three or four years. That is long enough for the contents of a full cess-pit to turn into a harmless fertiliser, or paperweight.

In addition, much of the methane—a gas that contributes to global warming— that is emitted by the waste will be

harmlessly absorbed by the surrounding soil.

As an alternative way of disposing of the gas, 175 of SISSO's public loos have been rigged with bio-gas digesters. These are underground tanks which create the right conditions for methane to be produced and stored. It can then be burned for heating or cooking, or used to generate electricity.

At a cost of 500,000 Indian rupees ($12,675), bio-digesters require at least 300 toilet users a day to produce enough gas to generate an economically viable amount of electricity.

By SISSO's calculation, a public loo with 2,000 users a day would produce 60 cubic metres of gas, which would run a 10 kilovolt-ampere generator set-up for eight hours a day, producing 65 units of power. This would be roughly enough to keep the toilet block's lights on.

With 30,000 users a day—each producing a cubic foot of gas—the organisation's biggest lavatory complex, near a Hindu pilgrimage site in Mumbai, presents a bigger opportunity. SISSO is trying to persuade local residents to use the gas it produces as a cooking fuel. It is also trying to develop more efficient ways of storing it.

In another innovation, the organisation has linked waste-water treatment to pisciculture. This involves purifying domestic waste-water, from bathrooms and toilets, by growing duckweed in it—then fattening up fish on the weed. The purified water remains rich in potassium, phosphate and nitrogen, and a useful fertiliser.

As its contribution to battling global warming, SISSO calculates that each year its 1.2m toilets conserve 87.6m cubic metres of gas that would otherwise be emitted into the atmosphere.